



# **Effects of Storage on the Chemical Agent Resistance of Joint Service Lightweight Integrated Suit Technology (JSLIST)**

11<sup>th</sup> Annual Govt-Industry Shelf-Life  
Symposium  
24-26 August 2004



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# Agenda



- JSLIST Overview
- JSLIST Additional Source Qualification (JASQ).
- JSLIST Extended Storage Tests
- Environmental Conditioning Effects of JSLIST
- Conclusion



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# Joint Service Lightweight Integrated Suit Technology (JSLIST)



- ▮ **Lightweight chem./bio protective garment includes two piece suit, overboots, and gloves.**
- ▮ **First fielded in 1997**
- ▮ **Air permeable to reduce heat stress.**
- ▮ **Can be laundered up to 6 times and worn for 45 days during service life.**
- ▮ **Service life of 120 days out of package.**
- ▮ **Recent data suggests service life can be extended.**



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# JSLIST Additional Source Qualification Program (JASQ)



- ▢ JSLIST liner is made exclusively by a German Company.
- ▢ Goal: Identify additional manufacturers of JSLIST which will be then be used by the 5 current JSLIST cut & sew production facilities for follow-on JSLIST suit production.
- ▢ Testing initiated August 2001.
- ▢ JSLIST tested side-by-side other vendors.



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# JASQ Test & Evaluation Phases



JASQ Test & Evaluation consisted of 4 Phases

- Phase 1 (Aug-Sep 01) Environmental storage
- Phase 2 (Oct 01-Feb 02) Field Durability,

Developmental Test (FDDT)

- Phase 3 (Mar 02) MIST & Aerosol Testing
- Phase 4 (Oct 02-Mar 03) Chemical Agent

Swatch Testing

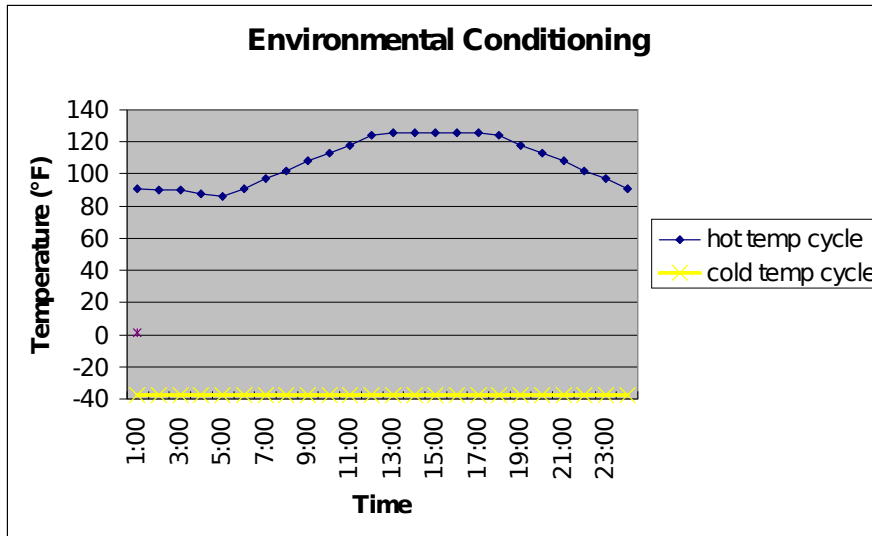


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# JASQ Environmental Storage Phase 1: Aug-Sep 2001



- 60 JSLIST suits undergo accelerated storage in vacuum packaging at Dugway.
  - 30 days in hot cycle storage (86-126 °F)
  - 30 days in cold cycle storage (-38 °F)
- Packages remain unopened throughout 60 days.



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# JASQ Field Durability Developmental Test

## Phase 2: Oct 2001-Feb 2002



**J ASQ PHASE 2**  
**Oct 01-Feb 02**

FDDT

Suits with 60 days  
storage from  
Phase 1



300 Marines wear  
J ASQ & J SLIST  
suits during FDDT  
at MCAGCC, 29  
Palms, CA  
(Oct 01 - Feb 02)

720 Cumulative wear  
hours



**Phase 2 testing  
examined  
durability &  
comfort issues**

7th Marine Regiment  
performing 24- and 96- hour  
Infantry training missions;  
Battalion-size units performing  
Live Fire, MOUT, Heliborne &  
Mechanized missions. 30  
suits each type, 0 to 90F  
temperatures, desert  
environment and solar load



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# JASQ System Test and Evaluation Phase 3: Mar 2002



- System Testing (MOPP 4 ensembles) in aerosol chamber at Research Triangle Inc., NC

Worn garments from Phase 2 were used for MIST & Aerosol Testing



- System Testing (MOPP 4 ensembles) in vapor chamber at Dugway Proving Ground, UT

**Phase 3 testing examined chemical performance issues for system level tests (MOPP 4 ensembles)**



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# JASQ Swatch Test and Evaluation

## Phase 4: Oct 2002-Mar 2003



Worn garments from phase 2 were used for chemical swatch & system testing

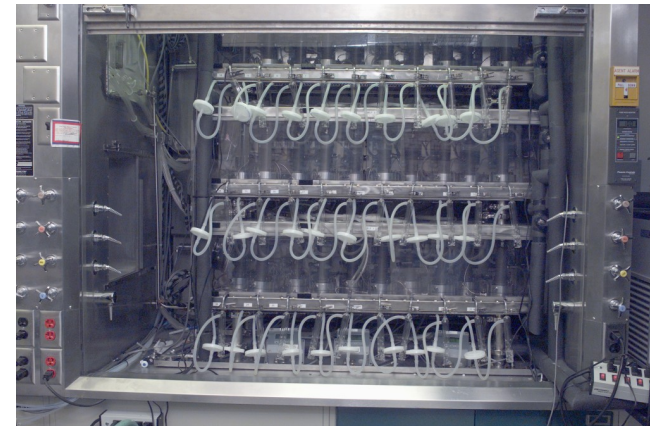
CHEMICAL TESTS:  
Worn JASQ Suits  
(45 days cumulative wear)



Material swatch tests on new, worn and treated or environmentally conditioned materials with agents HD, GD and VX,

The same test methods IAW TOP 8-2-501 and 10-2-022 will be used as were used on 45-day suits in JSLIST P31.

Phase 4 testing examined chemical performance issues for materials (swatch)



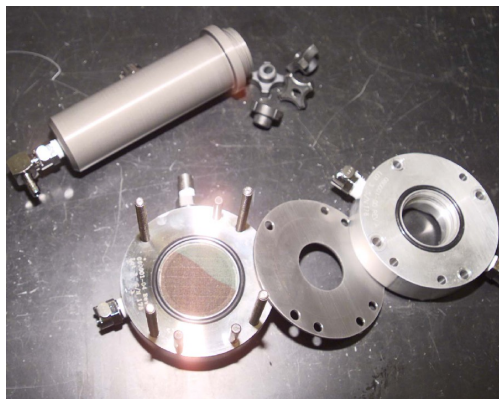
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# JASQ Swatch Test and Evaluation

## Phase 4 Cont.: Oct 2002-March 2003



- Worn JSLIST stored in sealed bags in controlled storage at Dugway from Mar-Oct 2002.
- Baseline HD and GD wet sweat swatch testing at Dugway and Battelle HMRC in October 2002.
- Suits placed in controlled storage at Dugway from Oct 2002-April 2003.
- HD and GD wet sweat swatch testing repeated at Dugway and Battelle HMRC in April 2003.
- No statistically-significant difference ( $\alpha = 0.05$ ) between the baseline materials and those stored for 6 months.
- Two-sample t-test using pooled variance used.



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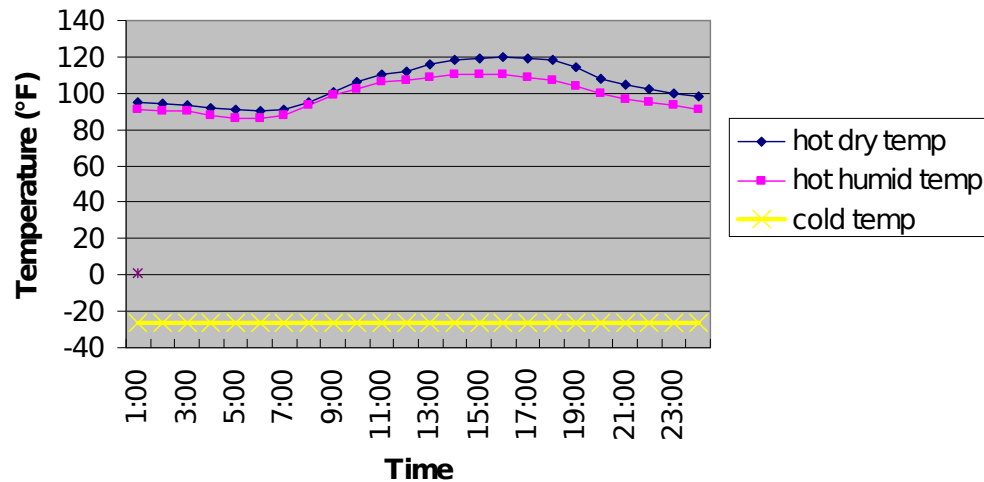




# JASQ Swatch Test and Evaluation Environmental Conditioning Oct-Nov 2001



**Environmental Conditioning**



- New out of bag JSLIST stored separately:
  - Hot dry (90-120 °F) for 45 days in Dugway chamber.
  - Hot (86-110 °F), humid (up to 40% RH) for 45 days.
  - Cold (-26 °F) for 45 days.
- Daily flexing 7 times per week.
  - Unfold and Donn.
  - Zip and unzip closures.
  - Doff and fold.
- After environmental conditioning complete, suits were placed in a sealed bag in controlled storage for 16 months.
- Swatch testing with HD and VX in March 2003 showed no degradation in chemical agent protection compared to new JSLIST.



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# JSLIST Shelf Life Conclusions



- No degradation in chemical agent resistance of JSLIST after:
  - 45 days of wear and between 8 and 14 months of controlled storage (60-75 °F, < 70% RH).
  - Out of package suits stored for 45 days between 90 and 120 °F at low humidity followed 16 months of controlled storage.
  - Out of package suits stored for 45 days at -26 °F followed by 16 months of controlled storage.
  - Out of package suits stored for 45 days between 86 and 110 °F at high humidity followed 16 months of controlled storage.



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